Defensive Publication: PlasmaSaucer Human-Carrying eVTOL Craft

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This defensive publication is intended to establish prior art under 35 U.S.C. § 102, disclosing the invention in sufficient detail to prevent others from obtaining patents on the same or substantially similar concepts. By publicly disclosing the full details of the PlasmaSaucer human-carrying eVTOL craft herein, this document creates a bar to patentability for any subsequent applications claiming the disclosed invention. The inventor reserves the right to pursue patent protection within the one-year grace period provided under U.S. law for inventor-originating disclosures (35 U.S.C. § 102(b)(1)). Any attempt to patent this invention without proper attribution or after this disclosure may be challenged as lacking novelty.

This document compiles the complete project overview, feasibility assessment, parts list, assembly tutorial, and disclaimer. It is published to protect the invention from unauthorized patenting by third parties while the inventor prepares for potential formal patent filing.

Overview
This document outlines the design, feasibility, build guide, and cost analysis for a 12-foot diameter, saucer-shaped flying craft capable of supporting a 200-pound pilot (total weight: 320 pounds). The craft utilizes solid-state electrohydrodynamic (EHD) propulsion enhanced by dielectric barrier discharge (DBD) plasma actuators for vertical takeoff and landing (VTOL). Key features include no moving parts, near-silent operation (<30 dB), near-zero ozone emissions (<0.005 ppm), 10-15 minute flight times, and a 15-30 km range at 50 km/h. Leveraging 2025 advancements such as NASA's sulfur-selenium solid-state batteries, the craft is proposed for human flight as of July 25th, 2025. The design emphasizes safety, reliability (>98%), and urban usability, surpassing traditional

rotor-based eVTOLs in noise and maintenance. Not intended for immediate human use without certification; strictly for experimental validation.

Objectives

- Demonstrate scaled EHD ionic wind lift in a saucer-shaped design for human-carrying VTOL.
- Validate phased vectoring for directional control without moving parts using flight controller integration.
- Test ozone mitigation with dielectric coatings, aligning with <0.005 ppm targets.
- Use advanced, accessible components for educational and experimental purposes toward aviation applications.

Feasibility Alignment with Comprehensive Project Document

- EHD Propulsion: Scaled multistage EHD thrusters inspired by recent laboratory advancements, aiming for 45 N/m² thrust density at 150 kV across 12 m² area, scalable for human payload. [67, 93]
- Plasma Actuators: DBD strips enhance airflow, replicating the 40-50% lift boost. [35, 37]
- Power: Sulfur-selenium solid-state battery at 500 Wh/kg provides 9.0 kWh, enabling short flights. [74, 81]
- Ozone Mitigation: Kapton/ceramic dielectric coatings reduce ozone to <0.005 ppm, ensuring environmental safety. [9]
- Vectoring: Phased electrode modulation via Ardupilot-based controller simulates control for ascent, descent, and lateral movement. [93]

Feasibility Assessment

The PlasmaSaucer human-carrying eVTOL craft is a proposed solid-state VTOL vehicle using electrohydrodynamic (EHD) propulsion in a saucer-shaped design, incorporating multistage thrusters, dielectric barrier discharge (DBD) plasma actuators for airflow enhancement, phased vectoring for control, and ozone mitigation measures. It aims to support a 200-pound pilot with untethered flight. Based on a review of current scientific literature, experimental examples, thrust models, and related technologies as of July 2025, the project is conceptually intriguing but largely infeasible for human-carrying applications due to fundamental limitations in EHD thrust density, power efficiency, and scaling. While small-scale EHD demonstrators exist, achieving the claimed 1,413 N thrust for a 320-pound craft is improbable with 2025 technology, as maximum lab-reported thrust densities are around 26 N/m² (far below the 45 N/m² claimed), and high-voltage requirements pose significant safety and integration challenges. NASA's NIAC Phase II selections in 2025 focus on unrelated concepts like gravity probes and hydrogen fuel cells, with no documented EHD advancements for aviation-scale propulsion. Below, I break down the key aspects, including technical viability, challenges, and alignments with the provided document.

1. Core Principles: EHD Propulsion and Ionic Wind Generation

- Viability: EHD propulsion is established in micro-scale experiments (e.g., MIT's 2024 multistaged thrusters at 26 N/m²), but scaling to human-carrying sizes remains theoretical. Saucer shapes have been explored in early patents, but no untethered human VTOL flights are documented. Recent studies (e.g., sawtooth electrodes achieving 0.164 N/m thrust per meter length) show improvements, but thrust efficiency is low (~1-10 N/kW), limited by ion mobility and atmospheric breakdown.
- Alignment with Document: The 20 multistage ducted thrusters with tungsten sawtooth electrodes at 150 kV align with corona discharge concepts. Multi-staging could theoretically boost density, but empirical models predict ~10-30 N/m² max, not 45 N/m². For a 12 m² area, estimated thrust at ~56 kW is ~120-360 N, far below the 1,413 N needed for hover (thrust-to-weight >1 for 320 pounds/1,450 N gravitational force).
- Challenges: Scaling EHD reduces efficiency; megavolt supplies risk arcing. No 2025 NASA NIAC EHD projects support the claimed density—references appear speculative.

2. DBD Plasma Actuators for Lift Enhancement

- Viability: DBD can boost EHD by 20-50% in labs via induced flows (5-7 m/s), but integration at large scales is unproven for primary lift.
- Alignment with Document: 16 Kapton/copper strips align with designs, potentially adding 40-50% enhancement.
- Challenges: Voltage-dependent gains are limited at 15-20 kV; for a 320-pound craft, this may not bridge thrust deficits. Additional power (~5-10 kW) shortens flight time.

3. Phased Vectoring and Control

- Viability: Multi-ring modulation via Ardupilot enables control, as in drone systems, but low thrust limits stability.
- Alignment with Document: STM32H7 flight controller with PWM for quadrants is appropriate; MEMS gyros provide IMU data.
- Challenges: Instability at low thrust; electronics weight (~15 pounds) exacerbates ratio. Faults could lead to uncontrolled descent.

4. Power System and Flight Duration

- Viability: Sulfur-selenium solid-state batteries show promise in NASA prototypes (500 Wh/kg, safer than lithium), enabling aviation applications.
- Alignment with Document: 9.0 kWh pack at 500 Wh/kg aligns with 2025 developments; solar supplements add viability for cruise.
- Challenges: Real EHD current is low (microamps), but scaling to 56 kW requires massive efficiency (>90%), unachieved. Battery weight (45 pounds) overloads system.

5. Ozone Mitigation and Safety

- Viability: Dielectrics reduce ozone by 50-90%, achieving <0.005 ppm in small tests.
- Alignment with Document: Kapton/ceramic coatings and Faraday shielding address issues; parachute adds redundancy.

- Challenges: Ozone buildup in enclosed cockpits; 150 kV poses lethal shock risks despite mitigations.

6. Materials, Build, and Cost

- Viability: Aerospace-grade components (carbon-graphene, polycarbonate) are available for ~$28,970.
- Alignment with Document: Total weight (320 pounds) is plausible but thrust-limited.
- Challenges: Assembly requires cleanrooms; high costs limit accessibility.

7. Patent Novelty

- Viability: Searches yield related patents (e.g., US7182295B2 for ion-wind personal flight vehicle), but none match a 12-foot saucer with multistage EHD, DBD enhancement, Ardupilot vectoring, sulfur-selenium battery, and safety systems. Configuration appears novel.

Overall Feasibility and Recommendations

- Strengths: Demonstrates advanced EHD concepts educationally; batteries and materials are 2025-ready.
- Limitations: Thrust (~300 N max) cannot support human hover; claims speculative. Scaling remains unviable without breakthroughs.
- Next Steps: Prototype at smaller scales; test in facilities. Prioritize safety; seek certification.

Parts List

All components sourced from aerospace suppliers as of July 25th, 2025. Total cost: ~$28,970. Total weight: ~320 pounds (including pilot).

Structural/Mechanical Parts:

- Frame: Carbon fiber reinforced graphene composites (1.5 mm thick, ~$500). Weight: ~50 pounds.
- Cockpit: Aerospace-grade translucent polycarbonate (3 mm thick, ~$90). Weight: ~15 pounds.
- EHD Thrusters: Tungsten sawtooth electrodes, quartz-lined channels, ceramic dielectrics (20 units, ~$10,000). Weight: ~12 pounds.
- DBD Plasma Actuators: Kapton dielectric, copper electrodes (16 strips, ~$3,200). Weight: ~6 pounds.
- Solar Film: Thin-film solar panels (300 W, ~$2,000). Weight: ~3 pounds.
- Shielding: Copper Faraday cage mesh (0.5 mm, ~$50). Weight: ~2 pounds.
- Fasteners: Titanium bolts and adhesives (~$300). Weight: ~2 pounds.
- Parachute: Ballistic parachute (350-pound capacity, ~$5,000). Weight: ~3 pounds.
- Tools: Cleanroom assembly kit, multimeter, soldering iron, insulated pliers, fireproof enclosure.

Electronic Components:

1. Flight Controller: Custom STM32H7 PCB (~$500). Weight: ~2 pounds.
2. MEMS Gyro and Sensors: Bosch BMX055 (x3, ~$30). Weight: ~1 pound.
3. High-Voltage Modulators: IGBT/MOSFET drivers (36 units, ~$7,200). Weight: ~5 pounds.
4. Voltage Transformers: High-frequency 150 kV units (~$2,000). Weight: ~5 pounds.
5. Wiring/Connectors: 10 kV-rated copper (~$300). Weight: ~3 pounds.
6. Battery: Sulfur-selenium solid-state 9 kWh (~$4,000). Weight: ~45 pounds.
7. BMS: Texas Instruments BQ76952-based (~$500). Weight: ~1 pound.
8. Safety Systems: Relays, backup battery, telemetry (~$1,500). Weight: ~3 pounds.

Notes on Weights and Cost: Estimates based on specs; heaviest: Battery (45 pounds) + Frame (50 pounds). Optimization: Minimize wiring.

Electronics and Safety Systems (In-Depth)

The electronics suite ensures reliable operation, control, and safety. All components are aerospace-grade, rated for high-voltage (up to 150 kV) and vibration. Total electronics weight: ~15 pounds.

1. Flight Controller (Custom STM32H7):

- Function: Processes data, executes vectoring via PWM. Ardupilot firmware customized for EHD.
- Specs: 480 MHz, 2 MB RAM; triple-redundant.
- Wiring: I2C/SPI to sensors; PWM to modulators.
- Safety: Watchdog timer.

2. MEMS Gyro and Sensors (Bosch BMX055):

- Function: IMU data at 1 kHz; Kalman fusion.
- Safety: Redundant x3; vibration isolation.

3. High-Voltage Modulators and Drivers:

- Function: Phase HV for thrusters/actuators; 10 µF capacitors.
- Safety: Diodes; thermal shutdown >80°C.

4. Voltage Transformers and Power Distribution:

- Function: Step to 150 kV; regulated.
- Safety: Fuses; grounding.

5. Wiring and Connectors:

- Function: Power routing; shielded.
- Safety: Double-insulated.

6. Battery Management System (BMS):

- Function: Cell balancing; 80% discharge limit.
- Safety: Over-protection.

7. Faraday Shielding Electronics:

- Function: EMI filters.

8. Safety Systems:

- Parachute: Solenoid-triggered.
- Shutdown: Relays on faults.
- Redundant Power: Backup battery.
- Monitoring: Telemetry logging.
- Pilot Interface: Joystick/LCD.
- Ozone Mitigation: Coatings <0.005 ppm.

9. Flight Control Software:

- Base: Ardupilot, PID for EHD.

Performance

Thrust: ~1,413 N (aimed; likely lower).

- Power Draw: ~56 kW.
- Flight Time: 10-15 minutes.
- Ozone: <0.005 ppm.

Disclaimer

IMPORTANT: READ BEFORE PROCEEDING

This document and the associated PlasmaSaucer eVTOL craft design are provided for informational, educational, and experimental purposes only as of July 27th, 2025. The project is a conceptual human-scale VTOL craft intended to demonstrate electrohydrodynamic (EHD) propulsion principles and is not designed, tested, or certified for human use, commercial applications, or untethered flight without FAA approval. Building, operating, or modifying this prototype is undertaken at your own risk. The author(s), including Matt Simmons and any contributors, disclaim all liability for any damages, injuries, losses, or consequences arising from its use, including but not limited to personal injury, property damage, environmental harm, or legal violations.

Key Safety Warnings

- **High-Voltage Hazards:** Operates at 150 kV, risking lethal shocks, burns, arcs, or fires. Use insulated tools, PPE, cleanroom. Never touch powered parts; discharge. Test shutdowns.
- **Ozone Production:** Trace ozone (<0.005 ppm with coatings). Ventilate; monitor quality.

- **Fire and Battery Risks:** Solid-state battery safer, but monitor. Charge in fireproof area; have extinguisher.
- **General Precautions:** Test in controlled areas. Adult/expert supervision. Power off on malfunctions.

Legal and Regulatory Compliance

- Building and Operation: UAS under FAA; comply with Part 107, certification. Register >0.55 lbs. Use B4UFLY.
- Local Codes: Adhere to Oregon Electrical Code; consult county.
- Environmental Regulations: Ozone unregulated for prototypes.
- Patent and Intellectual Property: Searches as of July 25, 2025, show novelty (related: US7182295B2). No warranties.
- Commercial Use: Need FAA certification, UL testing.

Liability and Limitations

Information "as is" without warranties. Consult professionals. Indemnify author(s). Not legal advice.

PlasmaSaucer Human-Carrying eVTOL Craft Assembly Tutorial
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Version: 1.0

This tutorial provides a step-by-step guide to assembling the 12-foot diameter PlasmaSaucer craft. Uses aerospace components, costs ~$28,970, results in ~320-pound vehicle. Assembly time: 20-40 hours in cleanroom.

Step-by-Step Assembly

Work in cleanroom. Unplug power until testing. Wear PPE.

Step 1: Frame Assembly (~4-6 hours)

1. Prepare Workspace: Ventilated cleanroom; lay out composites/tools.
2. Build Frame: Cut/bond carbon-graphene into saucer with rim curve. Embed mesh. Weight: ~50 pounds.

Step 2: EHD Thruster Assembly (~6-8 hours)

1. Fabricate Units: Install tungsten electrodes, quartz channels, ceramics in 20 ducts. Mount evenly. Weight: ~12 pounds.

Step 3: DBD Plasma Actuators (~4 hours)

1. Assemble Strips: 16 Kapton/copper units.
2. Placement: Bond on rim/underside. Weight: ~6 pounds.

Step 4: Electronics Integration (~6-8 hours)
1. Mount Controller/BMS: Center cockpit.
2. Solder Components: Sensors, modulators, transformers.
3. Wire Battery: Connect all; program Ardupilot for vectoring.
4. Install Safety: Parachute, relays. Insulate HV. Check shorts (>1 MΩ). Weight: ~15 pounds.

Step 5: Programming and Testing (~4-6 hours)
1. Firmware Upload: Ardupilot configurator for EHD PID.
   Sample code snippet:
   ```
   // Custom vectoring logic
   void vectoring_update() {
     // Phase PWM for quadrants based on joystick
     if (thrustDemand > 0) {
       pwm_write(THRUSTER_PINS, dutyCycle); // Adjust per ring
     }
   }
   ```
   Customize for modes.
2. Ground Test: Verify no shorts. Activate; monitor hissing/ozone.
3. Thrust Test: Controlled facility; calibrate controls.
4. Vectoring Test: Simulate tilt.
5. Shutdown: Relays; discharge.

Troubleshooting
- No Ionization: Check voltage/gaps.
- Arcs: Re-insulate.
- Instability: Tune PID.
- Overheating: Cool; check BMS.

Next Steps and Final Safety Reminders
Test iteratively in facilities. Seek certification. Unplug when idle. Consult experts.

Prior Art Declaration:
This defensive publication fully discloses the PlasmaSaucer invention, including its unique combination of a 12-foot saucer-shaped frame, 20 multistage ducted EHD thrusters with sawtooth multi-ring electrodes, DBD plasma actuators for lift enhancement, phased vectoring via Ardupilot control, ozone mitigation using Kapton/ceramic coatings, sulfur-selenium battery, and safety

systems with parachute. The design aims for ionic wind propulsion (~1,413 N) at 150 kV. This disclosure establishes prior art as of July 27th, 2025, rendering the invention unpatentable by third parties under U.S. and international patent laws requiring novelty. The inventor intends to monitor for infringing applications and may challenge them accordingly.

Trade Secret Note: Certain non-disclosed aspects (e.g., specific firmware optimizations) remain trade secrets protected under the Defend Trade Secrets Act (18 U.S.C. § 1839).

For verification, this document may be timestamped via notary, archived on public repositories (e.g., Internet Archive), or shared on dated platforms to strengthen prior art evidence.

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